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PROJECT COMPLETION REPORT

KOREA

FOURTH HIGHWAY PROJECT
(LOAN 1640-KO)

February 8, 1985

Projects Department
East Asia and Pacific Regional Office

KOREA

FOURTH HIGHWAY PROJECT (LOAN 1640-KO)

PROJECT COMPLETION REPORT

Table of Contents

PROJECT COMPLETION REPORT

KOREA - HIGHWAYS IV (LOAN 1640-KO)

PREFACE

This is a Project Completion Report (PCR) of the Fourth Highway Project for which Loan 1640-KO was approved in December 1978 for the sum of US$143 million.

The PCR was prepared by the East Asia and Pacific Transportation I Division, based upon a review of the project files and data supplied in February 1984 by the Ministry of Construction, Korea. Bank staff who worked on the project have also been interviewed.

The loan was closed on June 30, 1984.

In accordance with the revised procedures for project performance audit reporting, this Completion Report was read by the Operations Evaluation Department (OED) but the project was not audited by OED staff. The draft Completion Report was sent to the Borrower for comments; however, none were received.

PROJECT COMPLETION REPORT BASIC DATA SHEET

KOREA: FOURTH HIGHWAY PROJECT (LOAN 1640-KO)

KEY PROJECT DATA

Item	Appraisal Expectation	Actual or Current Estimate
Total Project Cost (US$ million)	378.2	508.0
Overrun (%)		34
Loan/Credit Amount (US$ million)	143.0	143.0
Disbursed	143.0	142.1 /a
Repaid to) as of	11.0	11.0
Outstanding to) December 1, 1983	132.0	132.0
Date Physical Components Completed	12/31/81	12/31/83
Proportion Completed by Above Date (%)	60	100
Proportion of Time Underrun or Overrun (%)		53.5
Economic Rate of Return (%)	26	35
Institutional Performance	Good	Good

OTHER PROJECT DATA

Item	Original Plan	Revisions	Actual or Est. Actual
First Mention in Files or Timetable	02/11/76	-	02/11/76
Government's Application	/ /	-	/ /
Negotiations	10/30/78	-	10/30/78
Board Approval	12/14/78	-	12/14/78
Loan Agreement Date	12/22/78	-	12/22/78
Effectiveness Date	03/14/79	-	03/14/79
Closing Date	12/31/82	12/31/83	06/30/84
Borrower		Republic of Korea	
Executing Agency		Ministry of Const./Bureau of Public Roads	
Fiscal Year of Borrower		January 1 - December 31	
Follow-on Project Name		Provincial and County Roads	
Loan/Credit Number		Ln 2228-KO	
Amount (US$ million)		125.0	
Loan Agreement Date		12/30/82	

MISSION DATA

Item	Month, Year		No. of Weeks	No. of Persons	Man-weeks	Date of Report
Identification	03/76					/ /
Preparation	10/76	/b	4	2	8	11/09/76
Preappraisal						/ /
Appraisal	04/78	/c	4	2	8	11/16/78
Total			8		16	
Supervision I	06/79	/d	3	2	6	07/20/79
Supervision II	12/80	/e	2.5	1	2.5	02/06/81
Supervision III	11/81	/f	4	2	8	12/18/81
Supervision IV	10/82	/g	4	1	4	12/10/82
Supervision V	10/83	/h	3	3	9	11/18/83
Total			16.5		29.5	

COUNTRY EXCHANGE RATES

Name of Currency (Abbreviation)			Won (W)
Year:			
Appraisal Year Average	1978	Exchange Rate:	US$1 = 485
Intervening Years Average	1979-83		US$1 = 700
Completion year	1983		US$1 = 783

/a US$ 0.9 million remains undisbursed; this balance has been committed for an equipment contract and should be fully disbursed by June 30, 1984.
/b Combined with Supervision of Highway I, II and III.
/c Combined with Completion of Highway I and Supervision of Highway II and III.
/d Combined with Supervision of Highway II and III.
/e Combined with Supervision of Highway III.
/f Combined with Supervision of Highway III, Preappraisal of Provincial and County Roads, and Preparation of Sector work.
/g Combined with Supervision of Highway III and Post-appraisal of Provincial and County Roads Project.
/h Combined with Supervision of Provincial and County Roads Project and Post-appraisal of Highway Sector Project.

PROJECT COMPLETION REPORT

KOREA - HIGHWAYS IV (LOAN 1640-KO)

HIGHLIGHTS

The Fourth Highway Project continued the Bank's assistance to the Government of Korea in improving its national road network (para. 2.02). The project was designed to meet increasing traffic volumes and also to introduce project lending with the Ministry of Home Affairs (MOHA) for the provincial and county road network (para. 2.03).

The project achieved all of its objectives, despite some unavoidable delays (para. 8.01). The construction and improvement of roads which originally were unpaved and in largely mountainous terrain was carried out successfully, though with an overall 18-month delay which was due to budgetary constraints (paras. 3.02-3.06). All civil works were executed by Korean contractors who were supervised by the staff of MOC assisted by a team consisting of local and foreign consultants (para. 3.07). The studies included under the project produced detailed construction and maintenance programs for Korea's tertiary (or gun) road network which is managed by MOHA (paras. 3.11-3.18). The ongoing Provincial and County Roads Project (Loan 2228-KO) is fully utilizing the studies' results. There is still a balance of US$0.9 million remaining in the loan which is being utilized for the purchase of road maintenance and traffic counting equipment. The project also included a training component which was designed to help replenish MOC's depleted engineering and transportation planning staff (para. 3.19). Finally, despite cost overruns, the economic rate of return is higher than that estimated at appraisal due to a considerable increase in traffic over appraisal projections (para. 6.03).

The outstanding feature of this project was the extensive use of local consultants, which continued a trend begun under earlier highway projects. It resulted in extensive responsibilities being placed in the hands of local consultants as they now form the greater part of the team. Current consulting studies have essentially local teams with some foreigners in selected, specialized positions (para. 7.03).

PROJECT COMPLETION REPORT

KOREA - HIGHWAYS IV (LOAN 1640-KO)

I. PROJECT BACKGROUND AND SECTORAL SETTING

The Transport Sector

1.01 Korea's export-led industrialization has been among the most successful examples of economic development in recent history. During 1962-78, real GNP grew by 10% p.a. and per capita income more than tripled in real terms. Coupled with industrialization and urbanization, major developments and changes in the transportation sector complemented and supported the transformation of Korea's economy. Passenger traffic tripled between 1964 and 1971 and then tripled again by 1981; freight increased nine times and five times respectively during the same period.

1.02 The Government of Korea's (GOK) basic objective in the past has been to increase transport capacity in line with projected traffic growth and to avoid major bottlenecks. This objective has been largely achieved. Furthermore, the transport system as developed is reasonably balanced, as there is no substantial uneconomic allocation of traffic among the various modes.

1.03 Large investments in transportation infrastructure have been complemented by a considerable effort to improve the efficiency of the transportation system through the establishment and strengthening of institutions to plan, construct, maintain and operate the facilities and services. This is true both in the public sector, with the establishing and strengthening of institutions such as the Bureau of Public Roads (BPR) and the Korea Highway Corporation (KHC), and in the private sector by the successful development of many contractors (some 500 firms) capable of handling a wide range of public works in Korea and abroad.

1.04 The Bank has played an active role in advising and assisting the Korean authorities in pursuing their transport objectives. A summary of investments follows.

	Signing Date	Loan/ Credit	Amount ($M)
1. Railways I	8/15/62	C-25	14.0
2. Railways II	12/08/67	C-110	11.0
3. Railways III	4/14/70	C-183	15.0
		L-669	40.0
4. Railways IV	11/22/72	L-863	40.0
5. Railways V	4/10/75	L-1101	100.0
6. Railways VI	4/10/78	L-1542	120.0
7. Railways VII	5/21/80	L-1863	94.0
Subtotal			434.0
8. Ports I	6/27/73	L-917	80.0
9. Ports II	4/28/77	L-1401	67.0
Subtotal			147.0
10. Coal & Cement	4/29/83	L-2267	122.0
11. Grant for Transportation Survey	9/13/65		0.2
12. Highway & Transportation Coordination Surveys	7/24/68	C-S4	3.5
13. Highways I	6/29/71	L-769	54.5
14. Highways II	1/25/74	L-956	47.0
15. Highways III	2/20/76	L-1203	90.0
16. Highways IV	12/22/78	L-1640	143.0
17. Provincial & County Roads	12/30/82	L-2228	125.0
18. Highway Sector Loan	3/22/84	L-2392	230.0
Subtotal			693.2
Total			1,396.2

The Road Subsector

1.05 In 1978, Korea had a road network of some 80,000 km consisting of 9,400 km of national highways, 10,900 km of provincial roads, 12,500 km of gun or county roads and some 47,000 km of village access roads. While road density was generally sufficient to serve transport needs, the condition of most of the network was inadequate. Only 58% of the national highway system and 8% of the provincial system were paved, and the unpaved roads, including unpaved national roads, were in poor condition. Despite some improvement in

maintenance, average driving speeds were only in the range of 25-35 kph. Korea's motor vehicle fleet at that time was comparatively small. The 275,000 four-wheel road vehicles registered in 1977 (Table 4) amounted to only 7.9 per 1,000 persons. This compared to 14.3 in Thailand, 15.4 in the Philippines and 48.2 in Malaysia, although only Malaysia had a higher per capita income. The vehicle fleet was, however, growing rapidly at 13% in 1975/76 and 25% in 1976/77. Growth jumped to 40% in 1977/78 and 70% in 1978/79, then fell to 10% in 1979/80 due to the oil price increases at that time. The fleet is now growing at about 25%.

1.06 Korea's highway development policy has been geared to building a network of roads to serve the short and medium distance traffic for which it has an economic advantage over the railroads. The Road Plan developed in 1968, in consultation with the Bank, proposed a vast program consisting of: (a) the development through 1986 of a network of about 4,000 km of trunk highways to form a grid of longitudinal and transversal axes linking the four major gate ports of Incheon, Busan, Mogpo and Mukho toward inland centers, and (b) the construction over a 10-year period of a 1,600 km two-lane expressway network on separate alignments from the old roads, which could be expanded when traffic volumes require it. The program is now 80% completed and serves industrial complexes located around Seoul and provincial capitals.

1.07 The first three Bank-financed highway projects supported the Road Plan and had a major impact in assisting the Government with the following: (a) construction and improvement of its national road system; (b) institution-building in the Ministry of Construction (MOC), which is responsible for the national roads; and (c) formulation of revised policies affecting the whole transport sector. Assistance with institution-building was provided for setting up the Bureau of Public Roads (BPR), MOC's field organization for maintaining the national highways, and for improving MOC's planning capability. Significant policy changes which were evolved through the highway projects include the adoption of more appropriate roads standards, relaxation of restrictive licensing of the road transport industry, revision of regulations governing vehicle weights and dimensions, and a modified government policy on toll roads requiring financial and economic studies prior to levying tolls on any road.

1.08 The Fourth Highway Project continued the efforts begun under the previous projects, and at the same time initiated Bank support for improvement of the provincial and county roads which had previously received little attention due to the considerable highway requirements of Government's industrialization policy. This report reviews the progress of the Fourth Highway Project, based on information provided by MOC and BPR and a review of the Bank's files in Washington.

II. PROJECT FORMULATION

Preparation Stage

2.01 The project was identified by the Korean Government and prepared with the assistance of consultants financed under the Second Highway Project. It arose out of Government's recognition that Korea's highway system in the mid-1970s was inadequate to serve the rapidly growing vehicle fleet and the increasing demand for road transport which was accompanying the country's rapid development. Government therefore increased highway investment under its Fourth Five-Year Plan (1977-81) and formulated a highway development program with the following objectives: to pave nearly 90% of the national system; to accelerate improvement of the provincial and tertiary systems; and to further strengthen the institutions responsible for the various systems. Government asked the Bank for assistance in reaching these goals, and the Bank responded by allocating an increasing proportion of its transport lending to the highway subsector and by financing the preparation of a Fourth Highway Project which supported all three of the Plan's objectives.

Project Objectives

2.02 The three previous highway projects had helped to bring about fundamental improvements in the Government's institutions concerned with national roads (under the MOC). This led to significant advances in the planning, design, construction and improvement of national roads and setting up of the MOC's field organization to maintain them. Studies were included in the Fourth Highway Project to strengthen the provincial and county road networks by preparing a long-range county road development program. This program combined with the development program prepared for the national road network under the third Highway Project Loan 1203-KO set the stage for a move to sector lending. The appropriate follow-on projects (Provincial and County Roads, Loan 2228-KO, and Highway Sector I, Loan 2392-KO) are both under way.

Project Description

2.03 The project was appraised by a Bank mission in April 1978. It consisted of the following components:

(a) construction and improvement, including paving, and supervision by consultants, of 36 sections of national roads totalling 955 km;

(b) construction and improvement, including paving, and supervision by consultants, of 10 sections of provincial roads totalling 278 km;

(c) procurement of additional road maintenance equipment for maintaining national roads;

(d) a study by consultants of provincial and county (gun) road planning, construction, maintenance, administration and financing, and of the institutions involved, and of gun road development to prepare an investment program, followed by further feasibility studies and detailed engineering of about 2,000 km; and

(e) provision of overseas training for MOC staff.

2.04 Feasibility studies and detailed engineering for items (a) and (b) were completed under the Second Highway Project on 33 of the 36 sections of national roads (880 km out of 952 km) and on four of the ten provincial roads (107 km out of 282 km), by foreign consultants in association with eight Korean consulting firms between August 1975 and early 1978. The remaining nine roads were proposed by the Economic Planning Board in January 1978 and accepted in principle by the Bank, subject to the provision of engineering data, cost estimates and economic justifications for the roads. Data indicated that all the proposed roads were likely to be justified, and detailed engineering for the nine roads and related bid documents were completed in early 1979 by the same consulting firms engaged for the other roads.

Appraisal Stage

2.05 The appraisal mission, composed of an engineer and an economist, visited Korea in April 1978 and reviewed the project documents. These included the detailed engineering plans, economic evaluation, bid documents and other information requested previously by the Bank.

2.06 Major issues raised at appraisal were:

(a) The Gyeongju-Pohang Road (23 km). The GOK wished to have this road constructed as soon as possible due to the very heavy truck traffic carrying steel from the Pohang factory. The MOC was considering bidding without international advertisement and starting the work as quickly as possible during 1978. Later on, the Bank would be asked to retroactively finance expenditures occurring before the date of Loan Signature. The appraisal team suggested that the lack of ICB would rule out Bank financing and asked the GOK to write the Bank on its final decision about including this road in the project.

(b) Maintenance Budget for National Roads. The GOK had not met its obligations under the Third Highway Project to make adequate budgetary provisions for maintenance of national roads. Actual provisions were 50% below requirements. The mission suggested that the Bank require as a condition of negotiations that the GOK confirm with the Bank that adequate provisions be made in the budget proposals to be presented to the National Assembly.

(c) Arrangements for Carrying out the Gun Road Studies. Difficulties arose because MOHA had no engineering staff and was not oriented to addressing problems concerning organization, equipment and budget for civil works institutions and the planning and execution of road improvements and maintenance works. MOHA subsequently decided that their new Regional Development Bureau (RDB), which was set up in February 1978, would be responsible for the studies, the terms of reference of which had been prepared by the appraisal mission.

(d) Financing of Local Cost of Consultants. Local firms were to be used for some of the consulting work, causing the foreign consulting cost of the project to amount to about 20% of total consultants' cost. It was therefore to be decided whether local costs of consultants (about $6.4 million for both foreign and domestic) would be financed by the Bank.

(e) Loan Amount. If the Gyeongju-Pohang road remained in the project and local costs of consultants were financed, the total loan amount would be about $150 million. This figure was $30 million more than the original provision in the lending program.

2.07 Loan negotiations were held in Washington from October 30 to November 3, 1978. The above issues were discussed, and it was agreed that the project would include the Gyeongju/Pohang road but no local cost financing for consultant services. This reduced the loan amount to $143 million and the total project cost to $378 million. It was agreed to allow funding levels for maintenance to lag about one year behind the amounts scheduled in the Loan Agreement for the Third Highways Project. The GOK also requested Bank agreement to levy tolls on two Bank-financed roads; this was provisionally approved, pending the submission of a satisfactory financial and economic analysis by the GOK. As for the studies, MOHA agreed to provide counterpart staff required to participate in and manage the studies.

2.08 The loan was approved by the Board on December 14, 1978, the Loan Agreement was signed on December 22, 1978, and became effective on March 14, 1979.

III. PROJECT IMPLEMENTATION

Overview

3.01 Contracts for construction and paving works were all awarded within five months of loan signing but many of them were not completed until June 1983, some 18 months behind schedule. The feasibility studies and detailed engineering for projects included in the current Provincial and County Roads Project were completed in September 1982, about four months behind schedule. The procurement of highway maintenance equipment started one year late and was completed by June 1984, about two years behind the original schedule. The project completion date was extended from December 31, 1982 to June 30, 1984 mainly to accommodate procurement of this equipment as well as the overseas training component, which was carried out two years behind schedule due to problems in finding English and other foreign language speaking staff to be trained.

Road Construction and Paving

3.02 Construction of the Gyeongju-Pohang Road was started in April 1979, some two months ahead of the overall project schedule. In order to facilitate rapid construction of the road, the Bank agreed to allow the GOK to invite bids directly from ten Korean contractors who had already been pre-qualified

by the MOC. MOC also required the winning bidder to complete the road in 16 months instead of the originally estimated 22 months. Actual completion took 18 months.

3.03 For the remainder of the roads, bidding was scheduled for July 1979, about four months later than originally envisaged due to budgetary constraints. The bid prices received on the first batch of roads were about 60% higher (in won) than engineering estimates due mainly to price escalation stemming from the prevailing highly inflationary climate. Hence, by July 1979, even before bidding was complete on all roads, it was realized that the cost estimates would have to be revised substantially upwards and adjustments subsequently made in the Bank disbursement percentages.

3.04 Although ICB was used, all 48 of the pre-qualified contractors were Korean since, despite extensive international advertisements, no foreign contractors expressed interest. All contracts were awarded to 42 successful bidders by late 1979 but inadequate budgetary provisions forced construction to proceed at less than half of the scheduled rate. Due in part to these budgetary limitations and the resulting extended construction schedule at a time of high inflation, civil works cost estimates rose by over 67% (in won) above appraisal expectations. The MOC tried to solve this problem by authorizing delayed reimbursements to contractors and arranging financing on concessionary terms from local banks in the interim. This led to a restoration of construction progress, but time lost could not be made up and by the original December 1981 target completion date, civil works were only about 60% complete. It should be noted that this was not the only project encountering difficulties during the early 1980s. At that time, Korea suffered a sharp slowdown in its economic development as it adjusted to the oil price shocks which were accompanied by an acceleration of inflation. The GOK's policy was to adopt tight monetary and fiscal policies. These actions, together with devaluations[1/] of the won, affected all Bank-financed projects which depended on significant counterpart funds from the Government's budget. Details of the timing and cost of all contracts are given in Table 1.

3.05 The quality of work was very good and no real technical problems were experienced with the contractors, rather it was their willingness to accept delayed payments and continue construction which allowed eventual completion of works. There were a few changes made during construction such as upgrading, mainly minor widening on several road sections and widening of the Nonsan bridge (Lot 59). At Lot 6, (Naedeog-Sodo) the road was extended by 4.7 km to include repair work and asphaltic concrete overlay of an existing rigid pavement. All changes were estimated to add about 8% to construction costs.

3.06 The actual length of roads improved and constructed totaled 1,187.1 km; the roads were handed over to the MOC field organization for maintenance.

1/ In 1980 the won was devalued five times and had the following exchange rates to the dollar: W 485 at 1/1/80, W 580 at 1/12/80, W 600 at 5/28/80, W 658 at 10/31/80 and W 682 at 11/10/80.

3.07 Supervision of the civil works contract was carried out by foreign consultants in association with Korean consultants and the MOC. Their performance was generally satisfactory. Reporting was prompt and in adequate detail for monitoring project performance.

Procurement of Road Maintenance Equipment

3.08 This component was intended to continue equipment procurement (then ongoing under the Second and Third Highway Projects) for use by the MOC maintenance organization. It originally consisted of trucks, loaders, asphalt mixing and compaction equipment, some specialized equipment for bridge repairs, snow removal and additional stocks of spare parts. Procurement was through ICB with all bidding arrangements handled by the Government's Office of Supply Republic of Korea (OSROK) which is the standard procedure. The numbers of the various types of equipment were decided by MOC and their consultants, who also prepared the specifications and other draft bid documents. Under covenants of the Highway II Project (Loan 956-KO), the MOC maintenance organization had just been extended from a pilot project to a full fledged organization covering all eight provinces and hence the equipment procurement needs were extensive.[2/]

3.09 Procurement of road maintenance equipment under the project was greatly delayed, and the first list of equipment to be procured was sent to the Bank in May 1980 (exactly two years behind schedule) for review and comment. While some of the delay was due to budgetary constraints, a good portion of it was in fact voluntary as OSROK was then actively procuring maintenance equipment under the Highway III Project (Loan 1203) and did not yet need to use funds from Loan 1640. This reflected an attempt to utilize funds from Loan 1203, which had been originally intended for the purchase of traffic counting equipment, before the closing date (12/31/79, later revised to 12/31/81). In April 1981 the Bank approved a BPR proposal for joint procurement under Loans 1203 and 1640. It was felt that allowing joint purchases under both projects would streamline procurement by reducing the frequency of bidding and evaluation, and respond to priorities for equipment delivery and utilization.

3.10 The Loan closing date has been extended to June 30, 1984 mainly to facilitate this component, and to date a balance of $0.9 million remains in the loan account. It is expected to be utilized shortly on reimbursements for the current batch of equipment on which OSROK issued invitations to bid in December 1983.

Feasibility Studies and Detailed Engineering

3.11 Part I - Provincial and Gun Road Organization and Maintenance Study, and Part II - Gun Road Development Study. Invitations were sent in February 1979 to four short-listed consulting engineering firms to submit proposals for

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2/ For example, the total length of national highways under MOC maintenance increased from 2,900 km in 1976 to 6,000 km by end 1982.

the feasibility studies. The winning bidder, French consultants together with a local firm, successfully conducted this study which started in September 1979 and was completed in September 1982, about four months behind schedule.

3.12 The Part I study analyzed institutions at the national, provincial and county (gun) levels concerned with planning, design, maintenance, construction and administration of provincial and gun roads, and of their financing. In its results, the study was to specify proposals for the improvement of the institutions, including any reorganization found necessary, and for the improvement of provincial and gun road maintenance, together with cost estimates and a program and time schedule for implementation.

3.13 The study marked the first Bank road subsector involvement with the Ministry of Home Affairs (MOHA). Initial difficulties were encountered in having study terms of reference reviewed and decisions made on arrangements for managing and executing this as well as the Part II study, since MOHA lacked an organization to deal with works institutions and programs. This was solved by MOHA's creating, in October 1979, a new Local Road Section in the Local Development Bureau. The section was staffed by four local engineers who worked as counterparts to consultant staff and participated in the review of findings and the formulation and eventual implementation of the action programs. The MOC also assisted extensively by initially administering the consultants' contract and providing overall coordination.

3.14 The draft report was submitted to the Bank in May 1980, about three months behind schedule. In its review, the Bank suggested that consultants examine the feasibility of (a) the maximum practicable use of contracted work for construction/improvement and maintenance (especially periodic maintenance); and (b) the establishment of a special account for equipment renewal to be replenished with contributions from user fees based on depreciation and financial charges.

3.15 The final report was submitted to the Bank in December 1981. Its basic output was the preparation of a comprehensive five-year 1983-87 maintenance program for the provincial and county road networks. The program will enable MOHA to establish, by 1987, effective organizations at central, provincial and county levels to carry out the routine and periodic maintenance of both networks. The report covered in detail the organizational requirements for maintenance such as establishing a Road Management Division in MOHA, setting up of an Equipment Renewal Special Account (ERSA) and extensive training of MOHA employees. It was also decided to use Double Bituminous Surface Treatment (DBST) on as many roads as possible where traffic volumes did not yet fully require asphaltic concrete and also to enable the paving of a greater number of currently unsealed road surfaces due to the lower unit cost of DBST. As for gravel roads, it was decided to perform 70% of regravelling by force account and, to allow this, small portable crushing/screening plants and allied equipment would have to be purchased for each province. The program outlined the physical output of the maintenance activities per km for each year, the timing of maintenance equipment procurement, the annual number of persons to be trained in specific fields, technical assistance requirements and related costs. Implementation of the five-year maintenance program would cost Won 129 billion (at May 1981 prices) and has started under the ongoing Provincial and County Roads Project.

3.16 The Part II gun road development study had the following objectives: the preparation of a tentative long-range program for improving gun roads; a five-year program for improving about 5,000 km of gun roads for inclusion in the Fifth Five-Year Plan (1982-86); and after review and selection by the Government in agreement with the Bank, the identification of 2,000 km of roads for improvement under a future Bank-financed project. The study was done in two phases from September 1979 to August 1982. The first phase screened 12,500 km of county roads, outlined a long-range improvement program, and identified a set of priority roads for further screening. The second phase used first-year benefit-cost ratios based on traffic and estimated construction costs, road functions and regional balance as screening criteria to select about 2,000 km of roads to be included for detailed analyses and subsequently 1,000 km for final design. The 1,000 km of roads selected are located in 80 of the 139 counties and are distributed throughout all nine provinces, with average daily traffic ranging from 50 to 1,200. The finished road surfaces would be asphaltic concrete (AC), double bituminous surface treatment (DBST) or gravel. The base cost per kilometer of the county road improvements averaged US$154,600 in 1982 prices. The cost is not unreasonable in the light of adverse climate and terrain conditions and average costs under the Fourth Highway Project ($341,000/km for two-lane provincial roads). Existing alignments were utilized to the extent compatible with sound engineering and road safety.

3.17 The final gun road development study was issued in September 1982, and included a detailed implementation schedule, starting in early 1983, which specified the organizational procedures and responsibilities at the central and provincial levels for (a) bid procedures and bid award; (b) the supervision of works and certification of costs of work executed, and (c) the scope of consultancy services needed and draft terms of reference. The results of this study form the civil works component of the ongoing Provincial and County Roads Project, Loan 2228-KO.

3.18 In view of the MOHA engineers' lack of experience in using DBST, it was subsequently agreed to extend the consultants' contract by three months to allow them to redesign some roads to DBST standards and some others to AC standards as these changes had been agreed at negotiations for the Provincial and County Roads Project. The consultants were also asked to prepare and arrange an overseas training program for MOHA officials and engineers in the theoretical and detailed practical aspects of executing DBST pavements, and a seminar was arranged in Seoul for Korean contractors in order to expose them to the practical aspects of executing DBST pavements.

Overseas Training of MOC Staff

3.19 The project initially included fellowships for overseas training of nine MOC staff for periods of up to one year in transportation economics and project evaluation, and in highway engineering with particular reference to maintenance. In accordance with the terms of reference for the civil works supervision component, the civil works supervisory consultants assisted MOC in selecting trainees. The initial invitation to participate in a training course was sent to MOC personnel in December 1979 (some nine months behind schedule) and the two individuals selected departed Korea in January 1980.

Subsequently, there were several selections and periodic departures of trainees until departure of the last trainee in June 1984. A total of thirty-seven individuals benefited from this program which was changed slightly from appraisal expectations by the greater use of short-term courses to accommodate more personnel. This component, though somewhat behind schedule due to the difficulty of finding English and other foreign language speaking personnel, was properly executed.

IV. PROJECT COST AND BANK LOAN

Project Cost

4.01 The total project cost was $508 million, rather than the $378.2 million estimated at appraisal. In current won, the total cost exceeded the appraisal estimate, including contingency allowances, by about 94%. However, because of the devaluation of the won in relation to the US dollar during project implementation, the total cost overrun expressed in current US dollar equivalent was 34%.[3/] The majority of the increase was due to price escalation during the highly inflationary construction period from 1979 to 1983.[4/] Details of actual costs and appraisal estimates are given in Table 2.

4.02 The original cost of the construction component was exceeded by 67% in won. Of this cost overrun, 59% was due to escalation of unit prices during the construction period (46 months) and 8% due to design changes.[5/] In dollar terms, there were overruns of 33% on road construction and improvement, 18% on consultants services, and 46% on training fellowships.

Loan Disbursements

4.03 Cumulative disbursements (detailed in Table 7) compared to appraisal estimates were as follows:

3/ US dollar figures are for illustrative purposes only as during project implementation, there were frequent and irregular devaluations of the won leading to an overall 61% reduction in its value. US$ conversions were based on the average value of the won in the period, hence the results are approximations.

4/ The wholesale price index was: 1976 = 100, 1977 = 104.4, 1978 = 116.6, 1979 = 138.4, 1980 = 192.3, 1981 = 235.5, 1982 = 247.6.

5/ Civil works supervisory consultants' estimates.

	FY1979	FY1980	FY1981	FY1982	FY1983	FY1984
			(US$ million)			
Appraisal	0.2	28.0	80.0	132.0	143.0	-
Actual	-	14.6	40.0	92.6	132.7	143.0

It should be noted that even though slower than appraisal estimates, disbursements were faster than the standard country profile which suggests a seven year schedule.

Reallocation of Loan Funds

4.04 At MOC's request, the Bank loan funds were reallocated on May 27, 1983 so as to utilize the unallocated funds. The total loan amount is expected to be withdrawn by June 30, 1984, when the balance committed for equipment procurement should be withdrawn. The following table gives the original and actual allocation of loan proceeds.

Category	Loan Agreement	Reallocation of May 1983	Actual as of June 8, 1984
		(US$ Thousand)	
1. Civil works	108,000	136,380	136,396
2. Road maintenance equipment, vehicles and spare parts	3,800	3,810	2,964
3. Consultants services	1,350	2,620	2,548
4. Overseas fellowships	100	190	178
5. Unallocated	29,750	0	0
Total	143,000	143,000	142,086

Fulfillment of the Main Loan Covenants

4.05 Compliance with covenants (Table 6) was generally satisfactory, though more could have been achieved under the study of road transport regulations. Other than the effects of budgetary shortfalls early in the project period, there was no hindrance to the smooth implementation of the project schedule. The Borrower adhered to agreements on toll policies, extension of the traffic monitoring system and eventually the provision of adequate road maintenance funding.

V. INSTITUTIONAL DEVELOPMENT

5.01 In addition to assisting the GOK in attaining its road construction goals, the Fourth Highway Project contributed to the development of all institutions involved in the road subsector (especially the MOHA) and prepared the basis for the First Sector Project. Hence the main beneficiary institutions were MOHA and MOC.

Ministry of Construction (MOC)

5.02 The training program has helped to rebuild MOC's technical capability which was weakened by a severe loss of experienced staff due to more attractive conditions elsewhere, generated by the extensive worldwide activities of Korean engineering and contracting firms. The program also provided staff training in fields such as transportation economics and highway investment planning which were not emphasized previously in Korea.

5.03 The project also continued assistance to the comparatively new and expanding MOC field organization for maintaining national roads. During project implementation, the principal limitation on its work capacity was the perennial budget shortfall (typically by 25% of estimated needs). The Bank continually reminded the GOK of the importance of reliable funding at adequate levels to maintain the road system, and by 1982 budget provisions were deemed satisfactory. The maintenance organization is being further developed under the Highway Sector Loan through the provision of technical assistance to introduce more modern management procedures for the maintenance of the paved road network.

Ministry of Home Affairs (MOHA)

5.04 At the outset, MOHA had little or no properly staffed road organization, but due to the technical assistance and studies financed under the project, its institutional capacity has developed rapidly. Before the project, MOHA maintenance organizations at the central and provincial levels were weak; no proper planning of work was done and maintenance was unsatisfactory due to lack of funds, trained staff, equipment and materials. This situation has improved as MOHA has been able to start developing the capability required for road maintenance.

Road Subsector Policies

5.05 The exchange of views between the Bank and Government has helped in the evolution of road subsector policies. Of these, the most important are the greater priority now being given to maintenance of the road network, adoption of the most cost-effective designs and the use of studies to analyze the effect of tolls before allowing their introduction on a road section.

Road Transport Industry

5.06 Commercial vehicle licensing has always been overly restrictive in

Korea. Under Section 4.04 of the Loan Agreement, MOT was supposed to conduct a review of regulations governing licensing of commercially-operated vehicles and exchange views with the Bank on relaxing some of the most restrictive provisions. The MOT did conduct a partial review but dialogue with the Bank was impeded by extensive changes in MOT staff and of the Government as a whole. There was still some beneficial result as the licensing of trucks and taxis was relaxed enough to eliminate restrictions on areas and routes of operations. This was intended to increase competitiveness and greater efficiency in road transport.

VI. ECONOMIC RE-EVALUATION

6.01 The economic evaluation at appraisal was carried out by the consultants on each of the 36 sections of national roads and 10 sections of provincial roads which were to be improved under the project. Measurable project benefits were mainly reflected in vehicle operating costs (VOC) due to the improved conditions of the paved roads compared with the existing rough gravel roads and other surfaces which were in poor condition.

Traffic

6.02 Traffic in 1982 was higher than expected on virtually all roads, with actual traffic exceeding forecasts by 20% on average (Table 3). Growth rates between 9% and 15% were common on most roads. In 1982, most of the roads had average annual daily traffic greater than 1,100 vehicles per day.

Re-estimated Rates of Return

6.03 Using traffic volumes and updated vehicle operating costs, the ERR for each road section was recalculated assuming future traffic growth at 7.5% p.a. and no further real increases in VOC, which is a conservative approach. The recalculated ERR (Table 5) ranges between 20% to 50% excluding time savings; this compares favorably with appraisal estimates of 16% to 40%, excluding passenger time savings. The weighted average ERR for all project roads was 35%, which is higher than the appraisal estimate of 26%. The ERRs are higher due mainly to the substantially higher than anticipated traffic volumes on the roads at completion. The rate of return at both appraisal and completion excludes investment in road maintenance equipment and studies which together total less than 4% of project cost.

VII. THE ROLE OF THE BANK

7.01 The project continued and expanded the dialogue between the Government and Bank, started under the previous three projects. This has led to the further evolution and implementation of policies and programs in the road transport subsector. Also, the studies undertaken provided the Government with a planning framework and directly led to Bank involvement with the secondary and tertiary MOHA road network.

7.02 In terms of policy development, the continued dialogue on mainte-

nance funding and reviews of road transport regulations led to further development of road transport policy. There is now a more decided emphasis on transport investment planning and the design of least-cost alternatives. Bank involvement contributed greatly to improving the quality of the projects which are now both better technically designed and implemented. This appears to be generally true for construction works and for maintenance organization and operation. In addition, there seems to have been an increased desire to improve the efficiency of the road transport industry, highway maintenance and planning capabilities.

7.03 During supervision missions, the Bank conducted an effective dialogue with the Borrower and assisted in solving various problems which occurred. The extensive use of local consultants and the Bank's support in this venture has led to the development of a competent local industry. Now, selected foreign consultants can be used in a team of mostly Koreans for the conduct of feasibility studies, and virtually all Korean teams for detailed engineering.

VIII. CONCLUSIONS

8.01 The project has achieved its overall twin objectives of paving the way for sector lending with MOC and pioneering institution development with the MOHA. It has also resulted in the addition of 1,189 km of all-weather paved roads to the Korean network. The economic returns on the construction components exceeded appraisal expectations, and the studies and training components contributed to the development of MOHA and MOC. The project also gave special impetus to maintenance and promoted efficiency in road transport by encouraging the relaxation of excessive restrictions.

KOREA

FOURTH HIGHWAY PROJECT (LOAN 1640-KO)

PROJECT COMPLETION REPORT

Actual and Expected Completions
(Amounts in W million)

No.	Lot no.	Item	Length (km)	Contractor	Contract period (months) Original	Contract period (months) Revised	Contract amount (at bid prices) Original	Contract amount (at bid prices) Revised (A)	Work completed to December 31, 1983 At bid prices	Work completed to December 31, 1983 At current prices (B)	Actual add'l cost to complete contract At bid prices (D)	Actual add'l cost to complete contract At current prices (E)/a	Actual total cost to completion At bid prices	Actual total cost to completion At current prices
A.	Construction Improvement National Roads													
1	4	Ssangyeong-Seoghang	36.2	Dongsan Const. & Co., Ltd.	(28) 08/22/79 12/31/81	(43) 08/22/79 03/31/83	5,762	6,389	6,389	9,885	627	970	6,389	9,885
2	9	Yongdu-Hongcheon	22.9	Meesung Const. Co., Ltd.	"	(34) 08/22/79 06/30/82	2,992	3,279	3,279	5,320	287	466	3,279	5,320
3	38	Daegu-Gasan	18.8	Shinsung Engr. Co., Ltd.	"	(34) 08/22/79 06/30/82	4,347	4,754	4,754	7,080	407	606	4,754	7,080
4	55	Anjung-Pyeongtaeg	21.6	Hanshin Constr. Co., Ltd.	"	(43) 08/22/79 03/31/83	5,161	5,536	5,536	8,387	375	568	5,536	8,387
5	15	Sintanjin-Cheongju	20.4	Daedeog Const. Co., Ltd.	"	(34) 08/22/79 06/30/82	2,832	2,979	2,979	4,660	147	230	2,979	4,660
6	35	Yeongju-Bonghwa	18.3	Hanil Industrial Co., Ltd.	"	(43) 08/22/79 03/31/83	2,529	3,526	3,526	5,389	997	1,524	3,526	5,389
7	6	Naedeog-Sodo	23.3	Namkwang Const. Co., Ltd.	"	(46) 08/22/79 06/30/83	4,635	5,157	5,157	8,447	522	855	5,157	8,447
8	59	Nonsan-Daejeon	29.4	Pacific Constr. Co., Ltd.	"	(43) 08/22/79 03/31/83	6,041	6,080	6,080	9,380	39	60	6,080	9,380
9	13	Hangyeryeong-Yangyang	28.4	Pyunghwa Constr. Co., Ltd.	"	(34) 08/22/79 06/30/83	3,671	4,555	4,555	6,200	884	1,203	4,555	6,200
10	13	Bonghwa-Hyeundong	28.0	Kukdong Constr. Co., Ltd.	"	(46) 08/22/79 06/30/83	5,582	6,553	6,553	10,399	971	1,541	6,553	10,399

No.	Lot no.	Item	Length (km)	Contractor	Contract period (months) Original	Contract period (months) Revised	Contract amount (at bid prices) Original	Contract amount (at bid prices) Revised (A)	Work completed to December 31, 1983 At bid prices	Work completed to December 31, 1983 At current prices (B)	Actual add'l cost to complete contract At bid prices (D)	Actual add'l cost to complete contract At current prices (E)/a	Actual total cost to completion At bid prices	Actual total cost to completion At current prices
11	8	Bangrim-Jangpyeong	20.5	Taehwa Const. Co., Ltd.	(28) 08/22/79 12/31/81	(46) 08/22/79 06/30/83	2,635	2,779	2,779	4,689	144	243	2,779	4,689
12	26	Gongju-Jeonui	29.0	Keumkang Limited	"	(46) 08/22/79 06/30/83	3,879	3,768	3,768	6,129	111	181	3,768	6,129
13	12	Wootong-Hangyeong	19.3	Jinduk Industrial Co., Ltd.	"	(34) 08/22/79 06/30/82	2,705	3,382	3,382	4,521	677	905	3,382	4,521
14	23	Daecheon-Machi	37.0	Poonglim Indust. Co., Ltd.	"	(46) 08/22/79 06/30/83	4,852	6,706	6,706	10,783	1,854	2,981	6,706	10,783
15	21	Seocheon-Buyeo	34.5	Dongah Const. Indust. Co. Ltd.	"	(43) 08/22/79 03/31/83	5,579	5,768	5,768	9,316	189	305	5,768	9,316
16	28	Nogcheon-Yesan	21.3	Keangnam Enterprise Ltd.	"	(46) 08/22/79 06/30/83	3,107	3,159	3,159	5,023	52	83	3,159	5,023
17	7	Mungog-Bangrim	35.4	Hankook Kunup Const. Co. Ltd.	"	(46) 08/22/79 06/30/83	5,027	4,963	4,963	8,224	64	106	4,963	8,224
18	31	Gijisi-Sinryeweon	26.7	Dainong Const. Co., Ltd.	"	(43) 08/22/79 03/31/83	4,052	4,460	4,460	7,070	408	647	4,460	7,070
19	14	Sogcho-Daejin	39.4	Samwhan Corp.	"	(43) 08/22/79 03/31/83	3,931	3,513	3,513	5,350	418	637	3,513	5,350
20	11	Sinnam-Inje	15.9	Limkwang Const. Co., Ltd.	"	(34) 08/22/79 06/30/82	2,629	3,872	3,872	5,149	1,243	1,653	3,872	5,149
21	25	Yuseong-Gongju	17.1	International Indust. Co., Ltd.	"	(43) 08/22/79 03/31/83	2,589	2,849	2,849	4,280	260	391	2,849	4,280
22	10	Chuncheon-Hwacheon	26.0	Miryung Const. Co., Ltd.	"	(43) 08/22/79 03/31/83	3,057	3,279	3,279	5,660	222	383	3,279	5,660
23	24	Machi-Gongju	28.2	Sunkyong General Const. Co., Ltd.	"	(43) 08/22/79 03/31/83	3,695	4,410	4,410	6,817	715	1,105	4,410	6,817
24	18	Goesan-Salmi	26.4	Namyang Jinheung Co., Ltd.	"	(46) 08/22/79 06/30/83	3,330	3,655	3,655	5,880	325	523	3,655	5,880

No.	Lot no.	Item	Length (km)	Contractor	Contract period (months) Original	Contract period (months) Revised	Contract amount (at bid prices) Original	Contract amount (at bid prices) Revised (A)	Work completed to December 31, 1983 At bid prices	Work completed to December 31, 1983 At current prices (B)	Actual add'l cost to complete contract At bid prices (D)	Actual add'l cost to complete contract At current prices (E)/a	Actual total cost to completion At bid prices	Actual total cost to completion At current prices
25	27	Dongdai-Nogcheon	22.9	Ducksan Constr. Co., Ltd.	(28) 08/22/79 12/31/81	(43) 08/22/79 03/31/83	2,946	3,151	3,151	4,830	205	314	3,151	4,830
26	1	Anseong-Janghoweon	38.1	Daelim Indust. Co. Ltd.	"	(46) 08/22/79 06/30/83	5,477	6,053	6,053	9,660	576	919	6,053	9,660
27	30	Seosan-Gijisi	33.0	Daewoo Dev. Co., Ltd.	"	(43) 08/22/79 03/31/83	5,015	4,470	4,470	7,040	545	858	4,470	7,040
28	16	Yongsan-Boeun	33.1	Limwang Const. Co., Ltd.	"	(46) 08/22/79 06/30/83	4,144	4,525	4,525	7,320	381	616	4,525	7,320
29	32	Yeongcheon-Gono	29.4	Bosung Const. Co., Ltd.	"	(43) 08/22/79 03/31/83	4,310	4,230	4,230	6,570	80	124	4,230	6,570
30	37	Hyeondong-Jangseong	29.4	Kongyung Const. Co., Ltd.	"	(46) 08/22/79 06/30/83	5,489	7,399	7,399	11,582	1,910	2,990	7,399	11,582
31	5	Seoghang-Naedeog	27.1	Jungwoo Dev. Co., Ltd.	"	(46) 08/22/79 06/30/83	4,367	5,192	5,192	8,560	825	1,360	5,192	8,560
32	29	Manripo-Taean	14.6	Seoil General Const. Co., Ltd.	"	(46/) 08/22/79 06/30/83	2,164	2,251	2,251	3,590	87	139	2,251	3,590
33	60	Janghoweon-Hoggye	23.0	Hanyang Corp.	"	(46) 08/22/79 03/31/83	3,441	3,369	3,369	5,340	72	114	3,369	5,340
34	33	Gono-Euiseong	12.7	Jungwoo Dev. Co., Ltd.	"	(46) 08/22/79 06/30/83	4,398	4,209	4,209	6,569	189	295	4,209	6,569
35	17	Hiweon-Goesan	26.1	Poonglim Indust. Co., Ltd.	"	(43) 08/22/79 03/31/83	2,987	3,436	3,436	5,530	449	723	3,436	5,530
36	44	Gyeongju-Pohang	23.4	Sambu Const. Co., Ltd.	(16) 05/28/79 09/30/80	(16) 05/28/79 09/30/80	10,515	10,604	10,604	13,444	89	113	10,604	10,444
		Subtotal A	956.8				149,872	164,260	164,260	254,073	14,388	22,101	164,260	254,073

No.	Lot no.	Item	Length (km)	Contractor	Contract period (months) Original	Contract period (months) Revised	Contract amount (at bid prices) Original	Contract amount (at bid prices) Revised (A)	Work completed to December 31, 1983 At bid prices	Work completed to December 31, 1983 At current prices (B)	Actual add'l cost to complete contract At bid prices (D)	Actual add'l cost to complete contract At current prices (E)/a	Actual total cost to completion At bid prices	Actual total cost to completion At current prices
B.	Construction & Improvement of Provincial Roads													
1	50	Balan-Suweon	19.4	Korea Dev. Corp.	(28) 08/22/79 12/31/81	(43) 08/22/79 03/31/83	4,292	4,201	4,201	6,532	91	141	4,201	6,532
2	53	Onyang-Asan Bay	14.9	Hankook Pav. Const. Co., Ltd.	"	(43) 08/22/79 03/31/83	3,254	3,300	3,300	5,160	46	72	3,300	5,160
3	22	Ungcheon-Guryong	29.1	Ducksoo Const. Co., Ltd.	"	(46) 08/22/79 06/30/83	3,200	3,625	3,625	5,858	425	687	3,625	5,858
4	61	Yecheon-Yeongju	25.3	Namkwang Const. Co., Ltd.	"	(43) 08/22/79 03/31/83	6,332	6,087	6,087	9,244	245	372	6,087	9,244
5	58	Cheongju-Jincheon	28.3	Chinhung Inter. Inc.	"	(43) 08/22/79 03/31/83	5,990	5,921	5,921	8,770	69	102	5,921	8,770
6	57	Jincheon-Gwanghaeweon	17.0	Hyundai Const. Co., Ltd.	"	(46) 08/22/79 06/30/83	2,402	2,424	2,424	3,990	22	36	2,424	3,990
7	2	Yangsu-Daeseong	14.7	Korea Machinery & Const. Co., Ltd.	"	(46) 08/22/79 06/30/83	1,483	1,578	1,578	2,571	95	155	1,578	2,571
8	51	Balan-Asan Bay	20.7	Ducksoo Const. Co., Ltd.	"	(43) 08/22/79 03/31/83	4,818	4,831	4,831	7,528	13	20	4,831	7,528
9	56	Gwanghaeweon-Yangji	32.2	Hyundai Const. Co., Ltd.	"	(43) 08/22/79 03/31/83	5,654	5,777	5,777	8,520	123	181	5,777	8,520
10	34	Gimcheon-Seonsan	21.2	Okpo Const. & Engr. Co., Ltd.	"	(46) 08/22/79 06/30/83	3,520	3,701	3,701	5,842	181	286	3701	5,842
11	3	Teogyeweon-Ildong	42.0	Hanil Dev. Co., Ltd.	"	(43) 08/22/79 03/31/83	3,857	4,181	4,181	6,720	324	521	4,181	6,720
		Subtotal B	264.8				44,802	45,626	45,626	70,735	824	1,343	45,626	70,735
		Subtotals A + B	1,221.6				194,674	209,886	209,886	324,808	15,212	23,444	209,886	324,808

/a Assumed to be in proportion to (A) and (B) ex. $E = (D) + \frac{(B) - (A)}{(A)} \times (D)$

Table 2

KOREA

FOURTH HIGHWAY PROJECT (LOAN 1640-KO)

PROJECT COMPLETION REPORT

Appraisal Estimates and Actual Project Costs

Project element	Length (km)	Estimated cost				Actual cost			
		Foreign (Won million)	Total (Won million)	Foreign (US$ million)	Total (US$ million)	Foreign (Won million)	Total (Won million)	Foreign (US$ million)	Total (US$ million)
A. Construction & improvement of national roads	950	40,381	96,146	83.26	198.24	62,495	254,073	89.27	362.96
B. Construction & improvement of provincial roads	280	12,017	28,612	24.78	58.99	32,694	70,735	46.70	101.05
C. Road maintenance equipment /a		1,843	2,425	3.80	5.00	2,667	2,667	3.81	3.81
D. Consultants services:									
Supervision of A&B		437	1,319	0.90	2.72	1,134	2,485	1.62	3.55
Feasibility studies and detailed engineering		218	2,425	0.45	5.00	651	3,857	0.93	5.51
Subtotal		655	3,744	1.35	7.72	1,785	6,342	2.55	9.06
E. Training fellowships		48	63	0.10	0.13	133	133	0.19	0.19
F. Contingency allowances:									
Physical /b		5,494	13,099	11.33	27.01	-	-	-	-
Price /c		8,921	21,264	18.38	43.83	-	-	-	-
Subtotal		14,415	34,363	29,71	70.84	-	-	-	-
Total A-F		69,359	165,353	143.00	340.92	99,774	333,950	142.52	477.07
G. Right-of-way		-	18,090	-	37.30	-	21,814	-	31.16
Total Project Cost		69,359	183,443	143,00	378.22	99,774	355,764	142.52	508.23

/a Component not yet completed.

/b Ten percent on all items.

/c Price escalation assumed to be at annual rates of 7-1/2% in 1979 and 7% during each year thereafter for both local and foreign costs.

Table 3

KOREA

FOURTH HIGHWAY PROJECT (LOAN 1640-KO)

PROJECT COMPLETION REPORT

Traffic Volumes on Project Roads

		Length	Appraisal: Average annual daily traffic 1975 Range	Appraisal: Average annual daily traffic 1975 Weighted average/a	Appraisal: Forecast /b 1982	1987	1992	1997	2001	Average estimated traffic growth (% p.a.) 1982-2001	Actual: Average annual daily traffic (AADT) 1982	Actual: Average annual daily traffic growth (% p.a.) 1975-82
A.	Construction and Improvement of National Roads											
1	Seongyeong-Seoghang	36	272-826	470	974	1,379	1,942	2,689	3,531	7.42	1,221	14.61
2	Yongdu-Hongcheon	23	384-458	430	1,139	1,638	2,351	3,365	4,562	8.01	1,482	19.34
3	Daegu-Gasan	19	1,287-3,571	1,636	3,237	4,734	6,963	10,375	14,577	8.72	5,323	27.55
4	Anjung-Pyeongtaeg	22	1,150	1,150	2,067	3,174	4,903	7,747	11,386	9.94	2,509	11.79
5	Sintanjin-Cheongju	20	428-637	544	1,365	1,996	2,954	4,444	6,301	8.87	2,239	22.40
6	Yeongju-Bonghwa	18	399-432	425	1,067	1,601	2,491	4,047	6,103	10.17	2,218	26.62
7	Naedeog-Sodo	23	152-354	189	455	657	965	1,448	2,052	8.73	650	19.30
8	Nonsan-Daejeon	29	430	430	751	1,128	1,596	2,441	3,499	8.93	2,488	28.50
9	Hangyeryeong-Yangyang	28	150-211	183	465	665	652	1,369	1,867	8.03	2,140	42.09
10	Bonghwa-Hyeundong	28	172-253	222	503	726	1,060	1,566	2,187	8.51	1,087	25.47
11	Bangrim-Jangpyeong	21	418	418	917	1,340	1,989	3,013	4,299	8.96	657	7.00
12	Gongju-Jeoneui	29	166-200	180	623	908	1,327	1,958	2,720	8.53	847	24.76
13	Weontong-Hangyeong	19	149-273	173	447	629	883	1.237	1.648	7.52	1,187	31.67
14	Daecheon-Machi	37	119-662	243	512	739	1,022	1,561	2,301	8.31	1,435	28.88
15	Seocheon-Buyeo	35	188-499	290	670	990	1,498	2,339	3,634	9.85	863	16.86
16	Nogcheon-Yesan	21	112-331	201	469	688	1,030	1,588	2,301	9.24	1,039	26.45
17	Mungog-Bangrim	35	112-308	206	474	692	1,028	1,564	2,239	9.01	495	13.34
18	Gijisi-Sinryeweon	27	342-609	461	1,012	1,465	2,147	3,199	4,501	8.64	1,823	21.70
19	Sogcho-Daejin	39	172-328	226	577	786	1,149	1,670	2,311	8.01	2,773	43.07
20	Sinnam-Inje	16	234	234	548	768	1,079	1,519	2,037	7.57	1,416	29.33
21	Yuseong-Gongju	17	125-143	134	647	969	1,478	2,317	3,392	9.64	1,689	43.62
22	Chunchaeon-Hwacheon	26	172-256	216	481	692	1,005	1,481	2,066	8.43	1,243	28.40
23	Machi-Gongju	28	119-374	213	477	692	1,019	1,529	2,166	8.77	1,271	29.07
24	Goesan-Salmi	26	48-796	146	660	987	1,498	2,306	3,327	9.40	448	17.37
25	Dongdai-Nogcheon	23	112-171	163	374	544	803	1,213	1,725	8.86	1,088	31.15
26	Anseong-Janghoweon	38	158-277	242	558	815	1,213	1,848	2,652	9.05	1,395	28.43
27	Seosan-Gijisi	33	229-304	251	535	775	1,136	1,695	2,389	8.67	1,348	27.14
28	Yongsan-Boeun	33	137-172	150	422	606	870	1,250	1,700	8.05	424	16.00
29	Yeongcheon-Gono	29	117-283	175	403	587	870	1,316	1,876	8.92	928	27.11
30	Hyeondong-Jangseong	29	132	132	327	457	641	891	1,180	7.39	908	31.72
31	Seoghang-Naedeog	27	153-156	154	362	505	704	967	1,266	7.20	537	19.53
32	Maaripo-Taean	15	50-134	127	298	441	673	1,062	1,565	9.65	574	24.05
33	Janghoweon-Hoggye	23	190	190	334	507	770	1,178	1,687	9.41	1,348	32.30
34	Gono-Eulseong	33	88-188	143	339	493	731	1,111	1,590	8.97	605	22.88
35	Miwoon-Goesan	26	89-163	124	456	673	1,008	1,531	2,180	9.10	843	31.50
36	Gyeongju-Pohang	23	2,470	2,470	5,570	10,400	20,100	34,000	53,000	13.33	8,583	19.48
B.	Construction & Improvement of Provincial Roads											
1	Balan-Suweon	19	660	660	1,159	1,747	2,651	4,046	5,781	9.34	5,112	33.97
2	Onyang-Asan Bay-Anjung	26	479	479	877	1,361	2,128	3,437	5,132	10.31	1,951	22.22
3	Ungcheon-Guryeong	29	107-423	172	381	543	778	1,110	1,504	7.93	1,260	32.91
4	Yecheon-Yeongju	26	405	405	728	1,115	1,721	2,719	3,992	9.92	1,468	20.20
5	Cheongju-Jincheon-Gwanghaeweon	46	390	390	680	1,021	1,541	2,336	3,320	9.21	1,420	20.27
6	Yangsu-Daeseong	14	27-164	53	367	525	758	1,103	1,520	8.22	1,010	52.36
7	Anjung-Balan	20	340	340	619	957	1,488	2,382	3,531	10.16	1,999	28.80
8	Gwanghaeweon-Tangji	32	290	290	515	783	1,199	1,868	2,713	9.67	1,309	24.02
9	Gimcheon-Seonsan	21	235-316	278	628	920	1,370	2,083	2,982	9.04	671	13.41
10	Teogyeweon-Ildong	42	128-337	200	528	604	957	1,217	1,741	6.85	2,030	39.25

/a Weighted averages use homogeneous section distances as weights. Military traffic is excluded.

/b Forecasts include generated and diverted traffic.

Source: Consultants and mission estimates.

Table 4

KOREA

FOURTH HIGHWAY PROJECT (LOAN 1640-KO)

PROJECT COMPLETION REPORT

Registered Motor Vehicles (1962-83)

Year	Cars /a	Trucks	Buses /b	Others /c	Total
1962	8,733	13,093	6,747	2,241	30,814
1963	9,569	13,929	8,132	2,598	34,228
1964	11,409	14,951	8,617	2,836	37,813
1965	13,001	16,015	6,316	3,179	41,511
1966	17,502	19,432	10,888	2,338	50,160
1967	23,235	22,953	11,499	3,008	60,697
1968	33,112	31,582	12,786	3,471	80,951
1969	50,299	40,134	14,237	3,999	108,669
1970	60,677	48,901	15,831	3,962	129,371
1971	67,582	53,405	17,411	5,939	144,337
1972	70,244	55,116	17,550	7,024	149,934
1973	78,334	64,584	48,871	8,925	170,714
1974	76,462	76,833	20,060	10,189	183,544
1975	84,212	82,862	21,818	11,629	200,521
1976	96,099	93,885	23,643	12,693	226,320
1977	125,613	118,150	26,710	12,279	282,752
1978	184,886	161,886	30,597	19,187	396,556
1979	241,422	206,822	37,697	190,413/d	676,354
1980	249,102	226,940	42,463	225,722	744,227
1981	267,605	243,828	50,595	286,061	848,089
1982	305,811	263,939	66,326	421,206	1,057,282
1983	380,993	304,158	87,282	541,686	1,314,119
			% Average Annual Growth		
1962-71	25.5	16.9	11.1	11.4	18.8
1967-71	30.6	23.5	10.9	18.8	24.2
1970/71	11.4	9.2	10.0	49.9	11.6
1971/72	3.9	3.2	0.8	18.3	3.9
1972/73	11.5	17.2	7.5	27.1	13.9
1973/74	-2.4	19.0	6.3	14.2	7.5
1974/75	10.1	7.8	8.8	14.1	9.2
1975/76	14.1	13.3	8.4	9.1	12.9
1976/77	30.7	25.8	13.0	-3.3	24.9
1977/78	47.1	37.0	14.6	56.3	40.2
1978/79	30.6	27.8	23.2	992.4/d	70.6
1979/80	3.2	9.7	12.6	18.5	10.0
1980/81	7.4	7.4	19.2	26.7	14.0
1981/82	14.3	8.2	31.1	47.2	24.7
1982/83	24.6	15.2	31.6	28.6	24.3
			Fleet Composition (%)		
1962	28.3	42.5	21.8	7.3	100.0
1967	38.3	37.8	18.9	5.0	100.0
1971	46.8	37.0	12.1	4.1	100.0
1972	46.8	36.8	11.7	4.7	100.0
1973	45.9	37.8	11.1	5.2	100.0
1974	41.7	41.9	10.9	5.5	100.0
1975	42.0	41.3	10.9	5.8	100.0
1976	42.5	41.5	10.4	5.6	100.0
1977	44.4	41.8	9.4	4.4	100.0
1978	46.6	40.8	7.7	4.9	100.0
1979	35.7	30.6	5.6	28.1	100.0
1980	33.5	30.5	5.7	30.3	100.0
1981	31.6	28.7	6.0	33.7	100.0
1982	28.9	25.0	6.3	39.8	100.0
1983	29.0	23.2	6.6	41.2	100.0

/a Includes taxis.
/b Includes microbuses.
/c Public service, motorcycles and special vehicles.
/d Effective mainly on motorcycles.

Sources: (1) Ministry of Transportation and mission estimates, April 1978.
(2) Statistical Yearbook of Transportation, MOT, 1983.
(3) Transport Sector Issues Survey, Report No. 4423-KO.

Table 5.1
Page 1 of 3

KOREA

FOURTH HIGHWAY PROJECT (LOAN 1640-KO)

PROJECT COMPLETION REPORT

Estimated Basic Vehicle Operating Costs /a
(Won/km at December 1983 prices)

	Car	Taxi	Trucks			Bus
			Light	Medium	Heavy	
Basic Vehicle Running Costs						
Fuel	27.23	27.23	40.22	48.05	51.77	46.05
Oil	0.73	0.73	1.49	1.49	1.49	1.42
Tires	1.61	1.61	1.48	3.53	4.12	3.91
Maintenance	12.28	9.54	22.29	38.34	61.23	33.94
Depreciation	15.02	10.52	17.46	43.19	64.01	44.40
Total (rounded)	56.80	49.60	82.90	134.60	182.60	129.70
Basic Vehicle Fixed Costs (Won '000 p.a.)						
Crew wages	-	3,501	4,294	5,071	7,072	8,162
Interest	-	453	588	1,846	3,369	2,382
Insurance	-	274	49	112	112	267
Inspection	-	112	100	124	168	95
Overhead	-	582	752	1,705	3,382	2,455
Total	-	4,922	5,783	8,858	14,103	13,361
Won per minute of running costs	-	68.30	80.30	109.30	174.10	161.90
Won per km at basic speed	-	51.20	74.10	100.90	160.70	127.80
Total Basic Operating Cost	56.80	100.80	157.00	235.50	343.30	257.50

/a Basic costs refer to a vehicle operating under ideal conditions; that is on a level, tangent, good paved surface, and running at optimum speed (cars and taxis 80 km/h, trucks 65 km/h, buses 76 km/h).

Source: MOC.

May 1984

KOREA

FOURTH HIGHWAY PROJECT (LOAN 1640-KO)

PROJECT COMPLETION REPORT

Estimated Average Vehicle Operating Costs and Savings on Project Roads /a
(Won/km excluding ta and passenger time savings)

	Cars	Taxis	Trucks	Buses
Existing Roads				
Range	114.1-207.6	220.0-518.1	512.6-1,277.4	580.1-1,484.5
Average	136.8	296.7	705.5	806.4
Improved Roads				
Range	65.7-95.6	123.3-173.1	279.5-383.5	320.7-428.6
Average	75.0	138.8	317.6	358.5
Savings				
Range	39.8-124.5	93.6-366.2	227.1-934.8	259.4-1,097.5
Average	61.8	155.0	387.0	455.7
Average excluding extremes /b	59.1	147.6	351.6	432.4

/a Operating costs in December 1983 prices.

/b Excluding the three lowest and three highest values. The three highest values are on rough mountain roads with a high proportion of mining truck traffic.

Source: MOC.

May 1984

Table 5.3
Page 3 of 3

KOREA

FOURTH HIGHWAY PROJECT - LOAN 1640-KO

PROJECT COMPLETION REPORT

Appraisal and Ex-Post Rates of Return

		Length km	Construction cost /a million won	Appraisal: Excluding passenger time benefits	Appraisal: Including passenger time benefits	Expost: Excluding passenger time benefit	Expost: Including passenger time benefit
A.	Construction and Improvement of National Roads						
1	Ssangyeong-Seoghang	36	2,903	40+	40+	44	46
2	Yongdu-Hongcheon	23	1,735	40+	40+	50+	50+
3	Daegu-Gasan	19	2,187	39.5	40+	50+	50+
4	Anjung-Pyeongtaeg	22	1,311	35.0	40+	50+	50+
5	Sintanjin-Cheongju	20	1,597	34.6	40+	41	43
6	Yeongju-Bonghwa	18	1,364	31.8	35.6	40.2	44
7	Naedeog-Sodo	23	2,198	30.1	32.7	21.6	23.4
8	Nonsan-Daejeon	29	2,644	30.0	33.0	50+	50+
9	Hangyeryeong-Yangyang	28	1,808	29.7	34.5	50+	50+
10	Bonghwa-Hyeundong	28	2,567	28.4	30.0	29	32.2
11	Bangrim-Jangpyeong	21	1,356	27.7	30.7	31	33.1
12	Gongju-Jeoneui	29	1,632	27.6	31.5	36.4	39
13	Weontong-Hangyeong	19	1,351	27.5	31.3	35.2	37.3
14	Daecheon-Machi	37	2,513	27.0	28.8	50+	50+
15	Seocheon-Buyeo	35	2,470	26.4	28.7	33.1	36.9
16	Nogcheon-Yesan	21	1,239	26.3	29.6	46.2	48.3
17	Mungog-Bangrim	35	2,375	25.6	28.5	25	27.5
18	Gijisi-Sinryeweon	27	2,477	25.4	28.3	50+	50+
19	Sogcho-Daejin	39	2,348	24.7	28.4	50+	50+
20	Sinham-Inje	16	1,444	24.2	27.3	34.5	36.2
21	Yuseong-Gongju	17	1,252	23.2	25.6	50+	50+
22	Chuncheon-Hwacheon	26	1,556	23.1	26.2	50+	50+
23	Machi-Gongju	28	1,968	23.0	25.4	48.5	50+
24	Goesan-Salmi	26	1,774	22.7	25.0	21	23.9
25	Dongdai-Nogcheon	23	1,357	22.5	24.2	48	99.8
26	Anseong-Janghoweon	38	2,731	21.5	23.8	50+	50+
27	Seosan-Gijisi	33	2,139	21.2	23.8	50+	50+
28	Yongsan-Boeun	33	2,199	21.0	23.3	21.8	24.9
29	Yeongcheon-Gono	29	1,970	20.1	22.0	37.3	39.1
30	Hyeondong-Jangseong	29	2,566	19.9	20.3	24.4	27.3
31	Seoghang-Naedeog	27	2,261	17.9	19.0	21.2	23.5
32	Manripo-Taean	15	1,014	17.0	19.0	24.6	26.4
33	Janghoweon-Moggye	23	1,704	17.0	19.0	24.1	26.1
34	Gono-Euiseong	33	1,930	16.7	18.3	47	49.3
35	Miweon-Goesan	26	1,489	16.1	17.1	43.9	46.8
36	Gyeongju-Pohang	23	5,243	27.1	30.5	50+	50+
B.	Construction & Improvement of Provincial Roads						
1	Balan-Suweon	19	1,221	35+	35+	50+	50+
2	Onyang-Asan Bay-Anjung	26	2,099	30.0	33.0	50+	50+
3	Ungcheon-Guryeong	29	1,776	28.3	29.7	50+	50+
4	Yecheon-Yeongju	26	2,076	28.0	31.0	46	47.9
5	Cheongju-Jincheon-Gwanghaeweon	46	4,227	26.0	30.0	38.1	42.3
6	Yangsu-Daeseong	14	909	24.9	26.3	40	45
7	Anjung-Balan	20	1,535	24.0	25.0	50+	50+
8	Gwanghaeweon-Yangji	32	2,975	24.0	26.0	32.4	36.3
9	Gimcheon-Seonsan	21	1,241	23.7	25.6	32.3	36.5
10	Teogyeweon-Ildong	42	2,305	20.9	23.9	50+	50+

/a Economic costs (net of taxes) in March 1977 prices.

Sources: Consultant L. Berger; Final Report, October 1977, Vols. B0 and B40.

KOREA

FOURTH HIGHWAY PROJECT (LOAN 1640-KO)

PROJECT COMPLETION REPORT

Compliance with Loan Conditions

Action required	Action taken
Section 3.02	
In order to assist the Borrower in: (a) the supervision of construction under Part A of the Project, and (b) carrying out of Part B of the Project, the Borrower shall employ consultants whose qualifications, experience and terms and conditions of employment shall be satisfactory to the Borrower and the Bank.	(a) Consultants' contract for supervision of construction was signed on June 9, 1979. (b) Consultants' contract for Study of Provincial and Gun Road Maintenance, and of Gun Road Development, signed September 10, 1979.
Section 3.05	
The Borrower shall:	
(a) carry out the study under Part B (1) of the Project in accordance with arrangements satisfactory to the Bank;	See (b) above.
(b) exchange views with the Bank on the conclusions and recommendations of said study as they become available; and	Study completed in September 1982 and reviewed by Bank. It recommended the Gun Road Development and Maintenance programs.
(c) based on the above take all steps necessary to ensure that the above recommendations are properly carried out in accordance with a program and schedule to be prepared by the Borrower in consultation with the Bank.	Recommendations being carried out in follow-up Provincial and County Roads Project (Ln 2228-KO).

Action required	Action taken
Section 3.07	
The Borrower shall levy tolls on any sections of the roads under Part A of the Project only: (a) after an economic and financial evaluation satisfactory to the Bank shall have been carried out by the Borrower and its findings reviewed with the Bank with respect to the imposition of such tolls on said road sections; and (b) by agreement between the Borrower and the Bank.	No tolls levied on project roads.
Section 4.03	
The Borrower shall, in respect of its national road system, continue to implement, and shall, in respect of its provincial road system, extend by December 31, 1980, or such later date as the Borrower and the Bank may agree, the implementation of its program of collecting and recording, in accordance with appropriate statistical methods and procedures, including regular and systematic traffic counts, such technical, economic and financial information as shall be reasonably required for proper planning of maintenance, improvements and extensions of its national and provincial road system.	Complied with.

Action required	Action taken
Section 4.04	
The Borrower shall:	
(a) complete, by December 31, 1980, or such later date as the Borrower and the Bank may agree, the review of its regulations governing licensing of commercially operated motor vehicles, including an analysis of the effects of previous revisions of said regulations, to permit owner-operated taxis, trucks and buses to qualify for a commercial license, particularly with respect to insurance forms, accident claims, levels of service, financial viability and other relevant aspects related to the licensing and operations of such vehicles; and	Ministry of Transport (MOT), Bureau of Land Transport, has undertaken a partial review of commercial vehicle licensing and regulation, based on a draft report by Korea Institute of Science and technology (KIST) on the Comprehensive Transport Study being financed under the Sixth Railway Project, Loan 1542-KO. The review, and the Bank's dialogue with the Government, has been impeded by extensive changes in the staff of the Government (particularly of MOT) and KIST. However, licensing of trucks and taxis has been relaxed to permit licensing of owner-operators and to eliminate restrictions as to areas or routes of operation, although overall quantitative limitation of licenses remains. The main relaxation for buses has been to allow mini-buses to operate; although routes are specified, they are allowed deviations for picking up and discharging passengers. This topic will be dealt with more extensively under the current Highway Sector Project.
(b) immediately thereafter, exchange views with the Bank on the results of the above review and the conclusions and recommendations derived therefrom with a view towards further revisions of said regulations to remove, by June 30, 1982, or such later date as the Borrower and the Bank may agree, present restrictions (other than those normal restrictions relating to safety and traffic control) on the licensing of motor vehicles for commercial operation on the Borrower's public roads network.	

Action required	Action taken
Section 4.05	
The Borrower shall:	
(a) at all times cause its: (i) public roads network to be maintained and all necessary repairs thereof to be made, all in accordance with appropriate routine and periodic maintenance practices; and (ii) road maintenance and workshop equipment to be maintained and all necessary repairs, renewals and replacements thereof to be made, all in accordance with appropriate engineering practices; and	Budget for 1979 was Won 15.4 billion as agreed in the Supplemental Letter on Road Maintenance. However, the budgetary provisions for 1980 and 1981 fall short of the estimates agreed in the Supplemental Letter (on the Maintenance Program) to the Agreement for Loan 1640-KO, when updated from 1979 to current prices. For 1980 the budget of Won 18.2 billion was only 72% of the (updated) estimated requirement of Won 25.4 billion and the 1981 budget of Won 22.2 billion is 74% of the (updated) estimated requirement of Won 29.9 billion. But by 1982 the budget was adequate and MOC has since been efficiently implementing the maintenance program.
(b) make all such arrangements satisfactory to the Bank as shall be necessary to ensure the timely and adequate provision of funds, through annual budgetary appropriations, facilities, services and other resources required for the above purposes.	

Table 7

KOREA

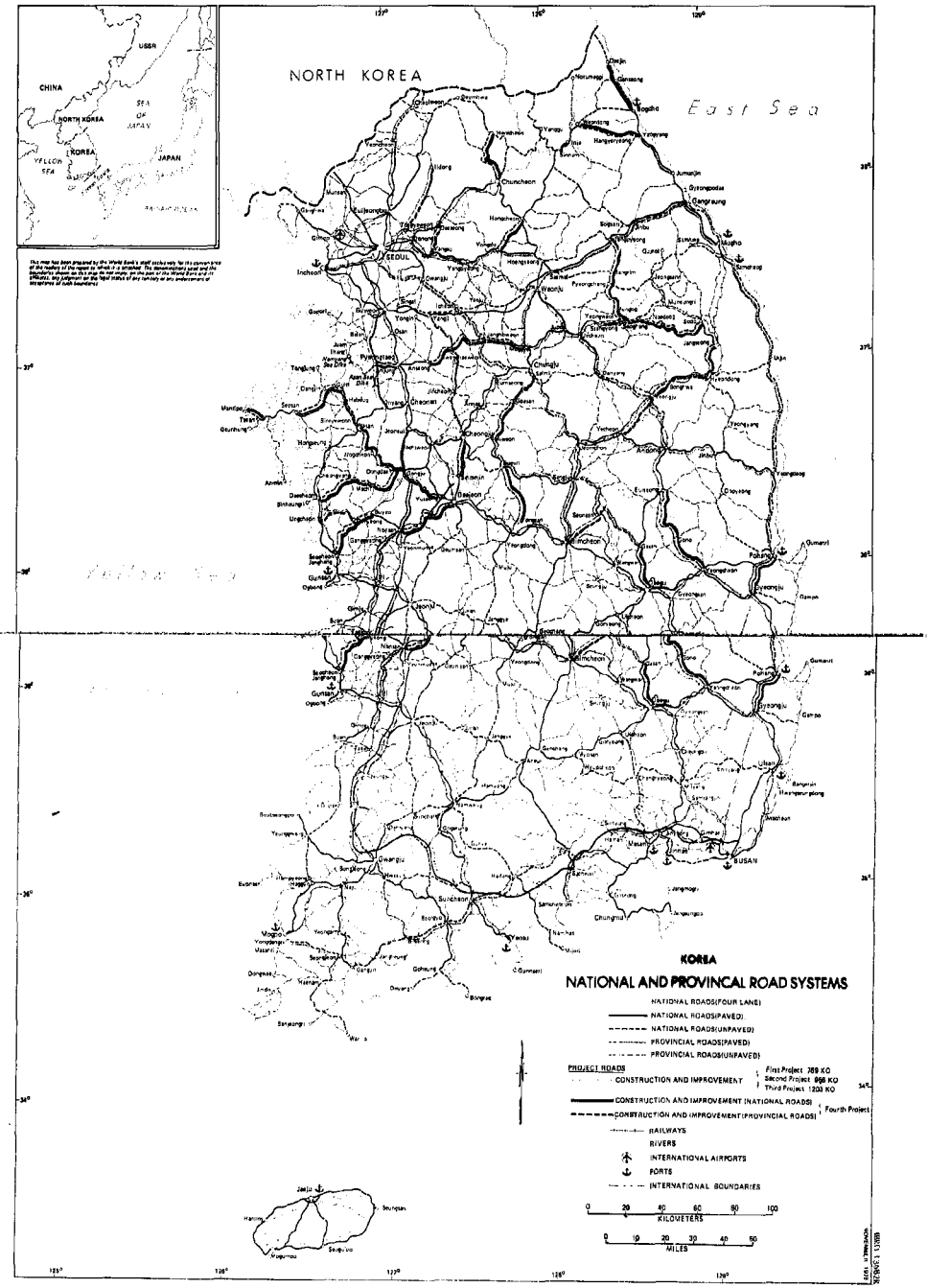
FOURTH HIGHWAY PROJECT (LOAN 1640-KO)

PROJECT COMPLETION REPORT

Accumulated Disbursements
(US$ million)

IBRD fiscal year and quarter	Appraisal estimate	Actual total disbursements	New disbursement estimate	New estimate of disbursements as a % of appraisal estimate
1978/79				
3rd	-	-	-	-
4th	0.2	-	-	-
1979/80				
1st	2.0	0.1	0.1	5
2nd	12.0	3.6	3.6	30
3rd	20.0	8.2	12.0	60
4th	28.0	14.6	14.6	52
1980/81				
1st	40.0	21.6	21.6	54
2nd	56.0	28.3	28.3	51
3rd	66.0	34.4	34.4	52
4th	80.0	40.0	40.0	50
1981/82				
1st	96.0	45.5	45.5	47
2nd	112.0	55.0	55.0	49
3rd	120.0	82.4	82.4	69
4th	132.0	92.6	92.6	70
1982/83				
1st	142.0	106.0	106.0	75
2nd	143.0	117.6	117.6	82
3rd	-	129.2	129.2	87
4th	-	132.7	132.7	93
1983/84				
1st	-	140.3	140.3	98
2nd	-	140.3	140.3	98
3rd	-	140.3	140.3	98
4th	-	142.1/a	143.0	100
Closing date	12/31/82		06/30/84/b	

/a Up to June 8, 1984.
/b Postponed to allow completion of equipment procurement.


NORTH KOREA
East Sea
Yellow Sea
SEOUL
BUSAN
KOREA
NATIONAL AND PROVINCAL ROAD SYSTEMS
NATIONAL ROADS(FOUR LANE)
NATIONAL ROADS(PAVED)
NATIONAL ROADS(UNPAVED)
PROVINCIAL ROADS(PAVED)
PROVINCIAL ROADS(UNPAVED)
PROJECT ROADS
CONSTRUCTION AND IMPROVEMENT
First Project 389 KO
Second Project 898 KO
Third Project 1203 KO
CONSTRUCTION AND IMPROVEMENT (NATIONAL ROADS)
CONSTRUCTION AND IMPROVEMENT (PROVINCIAL ROADS)
Fourth Project
RAILWAYS
RIVERS
INTERNATIONAL AIRPORTS
PORTS
INTERNATIONAL BOUNDARIES
KILOMETERS
MILES
CHINA
USSR
JAPAN
SEA OF JAPAN
YELLOW SEA